Constraining S Wave Velocity of the Source Region of Shallow Very Low-Frequency Earthquakes

*Takeshi Akuhara[1], Takashi Tonegawa[2]

1. Earthquake Research Institute, The University of Tokyo, 2. Research and Development center for Earthquake and Tsunami, Japan Agency for Marine-Earth Science and Technology

Shallow very low-frequency earthquakes (VLFEs), which are believed to occur in the vicinity of megathrusts, have been often associated with elevated pore fluid pressure. Lines of evidence for this idea include a small amount of stress drop, high tidal sensitivity, and reduced P wave velocity inferred from active source seismic surveys. Revealing the physical properties of the source region of shallow VLFEs will lead to a better understanding of their generation mechanisms. However, the challenge lies in the difficulty of acquiring S wave velocity in fine resolution.

Recent achievements by the authors may help overcome this issue. Akuhara et al. (2019) developed a robust technique to estimate Green's functions of receiver side structures from offshore seismograms, which are typically ill-conditioned due to water reverberations. Tonegawa et al. (2017) inverted Rayleigh wave admittance (i.e., a ratio of ground displacement to hydraulic pressure) for shallow S wave velocity structures beneath DONET seafloor observatories at the Nankai Trough subduction zone. Their velocity models show low-velocity zones that characterize the source regions of shallow VLFEs. However, a smoothing constraint imposed on the models renders their interpretation somewhat difficult.

This study presents preliminary results from transdimensional inversion of receiver-side Green's function estimated by the method of Akuhara et al. (2019), where we adopt a prior constraint by the velocity models of Tonegawa et al. (2017). Complementary to the Rayleigh admittance, the Green's function approach is sensitive to velocity contrasts and thus will offer an improved resolution.

Keywords: shallow very low frequency earthquake, seismic velocity structure, ocean bottom seismometer, bayesian analysis

